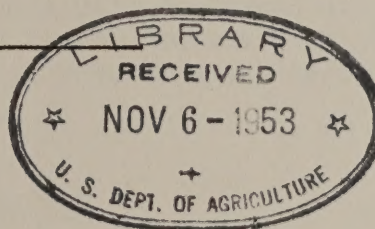


COLORADO 7 MESA

FIELD APPRAISAL ANALYSIS

Prepared by
Field Appraisal Section
Electric Operations Division
RURAL ELECTRIFICATION ADMINISTRATION



Field Appraisal
Completed in
July 1953

*

ALBERT E. BROWN

CHIEF OF POLICE

City of Chicago
Office of the Chief of Police
Chicago, Illinois
January 1, 1911

Respectfully,
Submitted to
You
1911

Very truly,
Yours

September 11, 1953

Field Appraisal Section
Electric Operations DivisionSUMMARY AND CONCLUSION
COLORADO 7 MESAAREA CHARACTERISTICS

The population of the area increased steadily over the period 1920-1950, while the number of farms declined. The number of farms increased during the 1920-1935 period and gradually declined from 1935-1950. Livestock and livestock products are the major source of agricultural income in the area. Part of the area is under irrigation and produces fruit and feed for livestock. The average value of farm land and buildings was \$15,323 per farm in 1950. Gross income from sale of farm products averaged \$4,445 in 1949. Both average farm property values and gross farm income were about one-half the average for the State as a whole. In 1950, 96 percent of the farms irrigated 18 percent of the farm land in the area. The elevation ranges from 4,500 to 11,000 feet. The growing season varies from 123 to 191 days.

ULTIMATE NUMBER OF CONSUMERS

On May 31, 1953, the cooperative was serving 2,968 consumers. The manager has estimated that a total of 3,642 consumers will be served ultimately. The present number of consumers includes 359 water heater accounts billed separately. The manager's estimates appear reasonable if water heaters continue to be regarded as separate accounts.

ESTIMATED FUTURE CONSUMPTION OF ELECTRICITY

Farm consumers indicated they expected to increase in 3 years their use by 21 percent; nonfarm and town residential consumers indicated they expected to increase their use by 9 percent over a like period. The cooperative is served by the Bureau of Reclamation and the rates are reasonably low. The principal increase in usage by farm consumers is indicated to occur in the home. Electric powered sprinkler irrigation systems have made little progress in the area so far. One-third of the respondents used LP gas for cooking, water heating, or house heating.

Based on factors believed to be significant, this analysis leads to the following estimates of average monthly consumption which are certified as being reasonable and may be expected to be attained in the years specified:

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<u>Class of Consumer^{a/}</u>	<u>Year Ended</u>			
	<u>June 1953</u>	<u>1955</u>	<u>1958</u>	<u>1963</u>
Farm	192	220	265	350
Nonfarm	191	200	225	265
Town Residential	151	160	190	230
Small Commercial	477	525	570	625
Public Buildings	132 ^{b/}	145	160	175
Irrigation (13HP) (annual)		13,000	13,000	13,000
Large Commercial (annual)				
White Water Sand & Gravel Co. (35kw)		25,000	25,000	25,000
(Potential) Mesa County Pipe & Bridge Co. (20kw)		50,000	50,000	50,000

^{a/} Water heating metered separately by cooperative for farm, nonfarm, and town residential consumers has been incorporated into the present averages, respectively, and is included in future estimates for these classes. This does not apply to the small commercial consumers.

^{b/} Estimated.

Richard G. Schmitt, Jr., Head
Field Appraisal Section
Electric Operations Division

September 11, 1953

Field Appraisal Section
Electric Operations Division

ANALYSIS OF BASIC FACTORS RELATED TO
THE RURAL ELECTRIFICATION LOAN FOR
COLORADO 7 MESA

This analysis of basic factors related to the future consumption of electricity by consumers of the Grand Valley Rural Power Lines, Incorporated, with headquarters at Grand Junction, Colorado (Figure 1), is based on a field study conducted during parts of June and July 1953 by Vergil Bufford, Agricultural Economist. This analysis was prepared by Earl A. Gardner, Agricultural Economist. The field work consisted primarily of interviews with 90 farm, 17 nonfarm, and 27 town residential consumers. Consumption data from billing records were secured for these classes. In addition, five small commercial consumers were interviewed.^{1/} Agricultural leaders were consulted regarding local economic trends. Supporting economic data were obtained from the U. S. Census for Mesa and Garfield Counties and from other secondary sources.

ULTIMATE NUMBER OF CONSUMERS

On May 31, 1953, the cooperative was serving 2,968 consumers. The appraiser indicated this figure included 359 water heater accounts billed separately. Water heaters were distributed among the consumers as follows: farm 268, nonfarm 42, town residential 39, and small commercial 10. The manager estimated an ultimate number of 3,642 consumers (Figure 2). This would indicate an increase of 674 consumers. The appraiser indicated considerable building of new homes in the served area adjacent to Grand Junction. The U. S. Census for 1950 indicates there are approximately 240 farms unelectrified in Mesa and Garfield Counties.

It is understood there has been a subdivision of acreage on the irrigation project, especially in the fruit area. This is partially responsible for the increased number of farm consumers in recent years. The cooperative has added approximately 230 farm consumers since 1950.

Based on the field appraisal and additional information obtained, the estimate of the 674 consumers to be added appears reasonable.

Analysis of consumer connections during the past 3 years reveals a sizeable turn-over in consumers, with increases in new consumers partially offset by consumer disconnections. The number of disconnections increased about one-third during this period, but this increased rate of disconnections was offset by about the same increase in reconnections. The difference between disconnections and

^{1/} Respondents in the survey were selected from a 5 percent BAE-type area sample for farm and nonfarm consumers. Town residential consumers were randomly selected on the basis of a 12½ percent tabular list sample.

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reconnections indicates an average of 51 net disconnections per year. It is assumed these net disconnections reflect a loss of consumers once served.

Based on the sample, the present number of idle services is 50 percent greater than the decrease in number of farms during the 1940-1950 period.

TABLE I
DISTRIBUTION OF CONSUMER UNITS WITH
RESPECT TO ELECTRIC SERVICE

Nature of Consumer Unit	Units In Sample	Estimate of Total Number of Units In Service Area ^{a/}
Farm, Served	90	2,041
Nonfarm, Served	17	201
Town Residential, Served	27	172
Small Commercial, Served	5	205
Not Interested In Service	3	69
Abandoned Houses	9	207
Vacant Houses	9	207
Idle Services	19	437
Served by Public Service	4	92
Total	183	3,631

^{a/} Derived by expanding sample data.

NATURE OF PRESENT AND INDICATED FUTURE CONSUMPTION
OF ELECTRICITY AS REVEALED BY THE SURVEY

A tabulation of the raw data secured from respondents revealed the monthly consumption figures shown in the following table.

TABLE II
INDICATED MONTHLY KWH CONSUMPTION^{a/}

Class of Consumer	Present	Future ^{b/}	Percent Increase
1. Farm Consumers	215	261	21
2. Nonfarm Consumers	244	265	9
3. Town Residential Consumers	162	176	9

a/ Based on indications by respondents in the survey and average energy requirements as determined by REA for the country at large.

b/ Based on what respondents expect to add in 3 years.

It should be noted that respondents classified as farm actually averaged 161 kwh per month during 1952; nonfarm respondents averaged 165 kwh per month and town residential respondents averaged 149 kwh per month. These figures include water heaters as part of the respondents' total use. It appears that farm consumers in this area use 75 percent, nonfarm consumers 68 percent and town residential consumers use 92 percent of the average usage as determined by REA for the country at large.

The service area has a farm income of less than one-half the average for the State as a whole. This probably explains in part the low average use of electricity per appliance on the farms.

Historical consumption records for all respondents in the survey having background data indicated a generally rising average consumption. This is revealed in Table III.

TABLE III

AVERAGE MONTHLY KWH CONSUMPTION OF
114 FARM, NONFARM AND TOWN CONSUMERS

Years of Service	Number In Group	Average KWH Consumption Per Month														
		1938	'39	'40	'41	'42	'43	'44	'45	'46	'47	'48	'49	'50	'51	'52
15	7	60	71	80	73	80	81	94	95	109	108	116	145	128	140	163
12	2	---	---	---	49	54	48	53	51	46	82	71	81	57	46	45
11	2	---	---	---	---	33	63	57	72	134	192	327	411	482	530	657
10	2	---	---	---	---	---	64	65	69	72	74	70	76	155	160	186
9	5	---	---	---	---	---	---	48	61	54	69	74	81	93	151	145
8	2	---	---	---	---	---	---	---	41	51	50	49	50	67	75	84
7	10	---	---	---	---	---	---	---	---	40	44	51	77	69	72	73
6	12	---	---	---	---	---	---	---	---	---	82	76	96	109	121	168
5	18	---	---	---	---	---	---	---	---	---	---	70	63	112	145	152
4	13	---	---	---	---	---	---	---	---	---	---	---	94	107	114	132
3	21	---	---	---	---	---	---	---	---	---	---	---	---	97	110	137
2	10	---	---	---	---	---	---	---	---	---	---	---	---	---	156	227
1	10	---	---	---	---	---	---	---	---	---	---	---	---	---	---	190
Weighted Average		60	71	80	68	67	71	69	72	67	79	82	95	110	130	158

A saturation of electrical appliances and equipment, measured in terms of the percent of consumers presently having them and a corresponding percent anticipated in the future, was compiled from field schedules. This is shown for all farm, nonfarm and town residential consumers in Table IV.

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TABLE IV

PRESENT AND INDICATED SATURATION OF ELECTRICAL APPLIANCES AND
EQUIPMENT AND CORRESPONDING ESTIMATED INCREASE IN KWH USAGE
FARM, NONFARM AND TOWN RESIDENTIAL CONSUMERS, COMBINED

Appliance or Equipment	Percent of Consumers		Increase	
	Presently Using	Indicating Future Use	Percentage Points	KWH Usage Per 100 Consumers
Air Compressor	2	2	--	--
Battery Charger	1	1	--	--
Blanket	8	8	--	--
Brooder (Hover)	24	25	1	121
Churn	1	1	--	3
Clock	63	64	1	18
Clothes Drier	1	1	--	--
Coal Stoker	2	2	--	--
Cream Separator	15	16	1	35
Dishwasher	1	2	1	30
Drill Press	16	20	4	48
Fan (Cent. Hot Air Cir.)	1	1	--	--
Fan (Household)	16	17	1	15
Fence	1	1	--	--
Food Mixer	49	50	1	25
Freezer (Home)	31	41	10	9,360
Garden Watering	25	26	1	75
Heating Pad	31	31	--	--
Hot Plate	34	35	1	70
Iron	94	94	--	--
Ironer	5	5	--	--
Lighting:				
Beef Cattle Barn	4	4	--	--
Bunk House	11	12	1	15
Cave or Spring House	7	8	1	5
Calf Brooder	1	1	--	--
Dairy Barn	1	2	1	35
Garage	17	18	1	8
General Barn	24	28	4	96
House Lighting	99	99	--	--
Milk House	7	7	--	--
Other Buildings	16	16	--	--
Poultry Brooder House	6	6	--	--
Poultry Laying House	16	17	1	35
Shop	7	11	4	48
Sheep Shed	1	2	1	12
Trailer	1	1	--	--
Yard	45	50	5	90
Livestock Watering	9	10	1	180

Table IV (cont'd) - Colorado 7 Mesa - September 11, 1953

Appliance or Equipment	Percent of Consumers		Increase	
	Presently Using	Indicating Future Use	Percentage Points	KWH Usage Per 100 Consumers
Milk Cooler	4	5	1	2,811
Milking Machine	6	7	1	462
Oil Furnace	1	1	--	--
Paint Sprayer	1	1	--	--
Percolator	34	35	1	60
Power Saw	17	19	2	24
Pressure System (Less than 22')	7	10	3	540
Pressure System (Greater than 22')	34	37	3	720
Radio	96	97	1	100
Range	23	28	5	6,000
Refrigerator	95	96	1	360
Refrigerator (Walk-in)	1	1	--	--
Roaster	7	7	--	--
Sewing Machine	22	22	--	--
Sheller, Corn	1	1	--	--
Soldering Iron	1	2	1	15
Space Heater (Portable)	9	10	1	70
Stock Tank De-icer	1	2	1	150
Stock Tank Heater	4	5	1	150
Toaster	63	65	2	70
Tool Grinder	16	20	4	100
Vacuum Cleaner	52	53	1	20
Waffle Iron	48	49	1	25
Washing Machine	86	87	1	35
Water Heater with Bath	12	19	7	22,500
Water Heater without Bath	1	1	--	--
Water Heater (Pressure Type)	3	3	--	--
Water Pail	1	1	--	--
Welder	1	3	2	150

a/ Data do not reflect instances of more than one of the same appliance per consumer.

ECONOMIC CHARACTERISTICS

The service area is located in the west central portion of Colorado and lies principally in Mesa County. It also covers portions of Garfield and Delta Counties (Figure 1).

The population of this area increased steadily over the period 1920-1950. From 1920-1935, the number of farms increased almost 800. From 1935-1950, the number of farms have decreased and were almost back to the 1920 figure. The ratio of the area to the number of farms in the State, however, has shown a steady increase through the period 1920-1950.

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Population increase in the area over the past 10 years was fairly evenly divided between the farm, nonfarm and urban areas. The largest increase was in the nonfarm group. In 1950, the rural-nonfarm population comprised 45 percent of the total, urban 28 percent, and farm population 27 percent. The employed labor force in 1950 was for the most part employed in trade, service utilities and miscellaneous groups. Agriculture accounted for 24 percent of the total, construction 9 percent, railroads and manufacturing 5 percent each.

Farms in the area averaged 304 acres in 1950. They were valued at \$15,323 per farm, compared to an average of \$26,164 for the State as a whole. Over the period 1945-1950, a marked difference occurred in land values between the area and the State as a whole. Farms in the area increased 79 percent during this 5-year period, while farms in the State increased 121 percent. Average income from all farm products sold by farms in the area in 1949 was \$4,445. This compares with an average of \$9,357 for the State as a whole. The income from farm products for the 1945-1950 period did not show any substantial increase per farm and is the apparent reason for the farm values being lower for the area in proportion to the rest of the State.

The major source of agricultural income in the area is from livestock and livestock products. Fifty-five percent of this income is from the sale of beef cattle and the remainder is mostly from sheep and hogs. Corn, oats, and barley are raised primarily for feed. There are 1,800 farms with less than 30 acres each in the area. These are mostly fruit farms growing peaches, pears, apricots, and apples. Cash income from fruit represents 46 percent of the crop sales.

According to the 1950 Census, 96 percent of the farms irrigate 18 percent of the total land in farms. Very few of the farms are irrigating with sprinkler systems.

Ownership of farms in full or in part is reported by 85 percent of the operators. General farming predominates on 86 percent of the farms. Over one-half of all farm operators reported off-farm employment in 1949, as compared to one-third in 1944, and over one-half of the operators reporting off-farm employment in each period reported working off the 100 days or more a year.

Farm facilities data for 1950 indicate 90 percent of the farms with central station electricity and 76 percent with telephones. U. S. Highways Nos. 50, 6 and 24 as well as State highways traverse the settled portions of the service area. The Denver and Rio Grande Western Railroad serves the area. Markets for crops and livestock appear to be adequate, the area being halfway between Denver and Salt Lake City. Grand Junction is the important trade center within the area.

There were 54 manufacturing establishments in the two-county area in 1947, according to the Census of Manufactures. One plant employed over 100 workers. Important types of manufacturing in order of importance were food and kindred products, lumber and lumber products, printing and publishing, and stone, clay, and glass products.

TABLE V

ECONOMIC TRENDS RELATED TO THE RATE OF
INCREASE IN USE OF ELECTRIC POWER

Item and Relationship	Trend					
Basic Economic Trends						
Population	1920	1930	1940	1945	1950	
Service Area	31,585	35,883	44,351		50,599	
State of Colorado	939,629	1,035,791	1,123,296		1,325,089	
Ratio Area to State	.0336	.0346	.0395		.0382	
Number of Farms	1920	1930	1935	1940	1945	1950
Service Area	3,137	3,680	3,931	3,604	3,455	3,312
State of Colorado	59,934	59,956	63,644	51,436	47,618	45,578
Ratio Area to State	.0523	.0614	.0618	.0701	.0726	.0727
Average Income From All						
Farm Products Sold		1929	1939	1944	1949	
Service Area		\$2,484	\$1,609	\$3,541	\$4,445	
State of Colorado		3,333	1,975	5,261	9,357	
Ratio Area to State		.745	.815	.673	.475	
Average Value of Land						
and Buildings		1930	1935	1940	1945	1950
Service Area		\$ 6,648	\$4,774	\$6,070	\$ 8,539	\$15,323
State of Colorado		10,497	6,580	7,550	11,855	26,164
Ratio Area to State		.633	.726	.804	.720	.586
Power Cost and Power Use Trends						
Cost of Purchased Power		1942	1945	1948	1952	
Colorado 7 Mesa		1.20¢	1.15¢	1.16¢	0.89¢	
All REA in State of Colo.		1.02	1.02	1.06	0.86	
Ratio Colo.7 to All		1.18	1.13	1.09	1.03	
Average Monthly KWH Con-						
sumption Per Farm Consumer		1942	1945	1948	1951	1952
Colorado 7 Mesa ^{a/}		57	73	102	115	157
Neighboring Co-ops ^{b/}		53	66	108	173	192
All REA in State of Colo. ^{c/}		64	88	135	198	--
Ratio Colo. 7 to All		.89	.83	.76	.58	--

^{a/} Based on operating reports. Whether and/or when water heaters included cannot be determined.

^{b/} Average of two systems' farm averages weighted on the basis of their number of farm consumers.

^{c/} Data from 14 power requirement studies for '42 and '45, other years all co-ops in State of Colorado.

PHYSICAL CHARACTERISTICS

The service area lies in a high mountainous section of the Rocky Mountains. The elevation varies from 4,500 feet in the lower Colorado River Valley to 11,000 feet in the Grand Mesa Area. Some of the area is covered with heavy timber and is located within the Grand Mesa National Forest. A valuable asset is the watershed furnishing part of the water for irrigation on the farms in the served area. Precipitation varies from 9 inches in the lower valley to 15 inches annually in the higher mountainous area. The growing season likewise varies from 191 days to 123 days in the lower and higher regions. Recorded temperature extremes are 108° F. and minus 38° F.

COMPETITIVE SOURCES OF ENERGY

Liquid petroleum gas is a heavy competitor of electricity at the present time. Thirty-six percent of the consumers interviewed indicated using or planning to use LP gas in the future, the order of importance in use being for cooking (85 percent), water heating (38 percent), and house heating (25 percent).

TABLE VI

STATUS OF LP GAS 134 RESPONDENTS
REPORTING IN RANDOM SAMPLE SURVEY^{a/}

Consumers' Position With Respect to Use of LP Gas	Number in Survey	Percent of Total
Not using and not planning to use	86	64
Not using but planning to use	1	1
Presently using LP gas	47	35
	134	100
Used for:		
Cooking	40	
Water Heating	18	
House Heating	12	
Planning to change to electricity	3	2
Cooking	3	
House Heating	1	

^{a/} All served farm, nonfarm and town respondents indicating use of gas.

ANALYSIS OF FUTURE FARM, NONFARM AND
TOWN RESIDENTIAL KWH CONSUMPTION

This cooperative was energized in 1937, and since 1938 average monthly farm consumption has increased to 170 kwh for the 12 months ended June 30, 1953. This is an increase of 9 kwh in average monthly usage per year. During the past 5 years, the average increase has been 14 kwh per year. The farm respondents indicated a 21 percent kwh increase, or 206 kwh average monthly usage in 3 years. Nonfarm consumers increased to 158 kwh over the 14 year period. The last 5-year increase was 8 kwh average per month a year based on operating report data. These respondents indicated a 9 percent kwh increase, or 172 kwh average monthly usage in 3 years. Town residential consumers were first listed on the monthly operating report in 1947. Since then they have increased to 123 kwh per month, or an average increase of 12 kwh per month per year based on the operating report data. These respondents indicated a 9 percent kwh increase or 134 kwh average monthly usage in 3 years. Farm consumers use electricity mainly in the home rather than in farm production. Even though the service area includes a large amount of irrigated lands, there has been little use of sprinkler systems for spreading the water on the land. The appraisal indicated no additional pumps for lifting water to a higher elevation for added irrigable lands, however, the manager believes there will ultimately be 25. Should the farmers become interested in the use of electrically powered sprinkler irrigation systems, the annual kwh usage of the cooperative would be increased substantially.

Indicated kwh increases and total usage by major uses to be achieved in 1956 are shown for farm, nonfarm and town residential consumers combined in Table VII. Four-fifths of the indicated increase for these consumers is expected to occur through the addition of four major home appliances.

TABLE VII

INDICATED SATURATION OF APPLIANCES AND EQUIPMENT AND KWH
USAGE FARM, NONFARM, AND TOWN RESIDENTIAL CONSUMERS BY
CHARACTER OF LOAD PER 100 CONSUMERS, 1956

Use	<u>Indicated Saturation</u>		<u>Indicated KWH Usage^{a/}</u>		
	Increase	Total	Increase	Percent of Increase	Future Total
<u>Major Household Uses</u>					
Water Heaters	10	26	22,500	50	58,500
Home Freezers	14	56	9,360	21	37,620
Ranges	7	39	6,000	14	34,800
Pressure Systems	8	64	1,260	3	10,680
<u>Major Productive Uses</u>					
Milk Coolers	1	7	2,811	6	14,055
Milking Machines	1	9	462	1	3,234
<u>Miscellaneous</u>			2,291	5	133,910
<u>Total--Indicated annual average usage</u> per 100 consumers			44,684	100	292,799
<u>Indicated annual average usage per consumer</u>					2,928
<u>Indicated monthly average usage</u>					244

^{a/} Based on electricity requirements for appliances and equipment for the United States as determined by REA.

The following table is a frequency distribution of future indicated electric consumption. This may be used in connection with reviewing any proposed changes in the rate structure for the system.

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TABLE VIII

FREQUENCY DISTRIBUTION OF INDICATED FUTURE MONTHLY
FARM, NONFARM, AND TOWN RESIDENTIAL KWH CONSUMPTION

<u>Average Monthly Consumption</u>	<u>Percent of Respondents</u>
Under 50	3
50 - 99	19
100 - 199	37
200 - 299	15
Over 300	26

TABLE VII

PERCENT DISTRIBUTION OF FARMERS BY AVERAGE ANNUAL GROSS INCOME FROM ALL SOURCES

Average Annually Gross Income	Percent of Farmers
Under \$50	3
\$50 - 99	23
100 - 199	27
200 - 299	13
Over 300	34